Chapter 1

An Overview of Red Hat Linux

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Linux was a phenomenon waiting to happen. The computer industry suffered from a rift. In the 1980s and 1990s, people had to choose between inexpensive, market-driven PC operating systems from Microsoft and expensive, technology-driven operating systems such as UNIX. Free software was being created all over the world, but lacked a common platform to rally around. Linux has become that common platform.

Red Hat Linux is the most popular commercial distribution of Linux. Red Hat and other commercial distributions, such as Caldera's OpenLinux, have taken the Linux concept a step further. With Red Hat Linux, users no longer have to download, compile, and check Linux source code to make sure that all the right pieces are put together for Linux to work. Basically, Red Hat has made it possible for Linux to be used by people other than computer geeks.

Red Hat Linux has also made Linux a more viable alternative for corporate users. Many companies have felt insecure about relying on a free operating system to handle their critical data. With Red Hat Linux, they can rely on Red Hat, Inc. (`www.redhat.com`) to provide tested versions of that software and technical support if there are problems.

Introducing Red Hat Linux

With Red Hat Linux 9, Red Hat continues to solidify and simplify the world's most popular commercial Linux distribution. While technical people continue to choose Red Hat Linux

because of its reputation for solid performance, Red Hat is making it easier for business people and home users to do their work (or just have fun).

New and enhanced graphical interfaces in Red Hat Linux 9 have made it possible for everyone to get even complex features working quickly. In particular, improvements have been made to graphical tools for:

- Sharing printers
- Configuring firewalls
- Setting up file sharing

With further improvements to existing graphical tools for adding applications, configuring system services, setting up wired and wireless networks, tuning your sound and video, and managing users and groups, you won't need your neighborhood techie standing over your shoulder to get stuff done with Red Hat Linux.

Over 1,400 individual software packages (compared to just over 600 in Red Hat Linux 6.2) are included in this latest release. These packages contain features that would cost you hundreds or thousands of dollars to duplicate if you bought them as separate commercial products. These features let you:

- Connect your computers to a LAN or the Internet.
- Create documents and publish your work on paper or on the Web.
- Work with multimedia content to manipulate images, play music files, view video, and even burn your own CDs.
- Play games individually or over a network.
- Communicate over the Internet using a variety of Web tools for browsing, chatting, transferring files, participating in newsgroups, and sending and receiving e-mail.
- Protect your computing resources by having Red Hat Linux act as a firewall and/or a router to protect against intruders coming in through public networks.
- Configure a computer to act as a network server, such as a print server, Web server, file server, mail server, news server, and a database server.

This is just a partial list of what you can do with Red Hat Linux. Using this book as your guide, you will find that there are many more features built into Red Hat Linux as well.

Support for new video cards, printers, storage devices, and applications are being added every day. Linux programmers around the world are no longer the only ones creating hardware drivers. Every day more hardware vendors are creating their own drivers, so they can sell products to the growing Linux market. New applications are being created to cover everything from personal productivity tools to programs that access massive corporate databases.

Remember that old Pentium computer in your closet? Don't throw it away! Just because a new release of Red Hat Linux is out doesn't mean that you need all new hardware for it to run.

Support for many old computer components get carried from one release to the next. There are old PCs running Red Hat Linux today as routers (to route data between your LAN and the Internet), firewalls (to protect your network from outside intrusion), and file servers (to store shared files on your LAN) — with maybe an Ethernet card or an extra hard disk added.

At this point, you may feel that Linux is something you want to try out. This brings us to the basic question: What is Linux?

What Is Linux?

Linux is a free operating system that was created by Linus Torvalds when he was a student at the University of Helsinki in 1991. Torvalds started Linux by writing a *kernel* — the heart of the operating system — partly from scratch and partly by using publicly available software. (For the definition of an operating system and a kernel, see the sidebar "What Is an Operating System?" later in this chapter.) Torvalds then released the system to his friends and to a community of "hackers" on the Internet and asked them to work with it, fix it, and enhance it. It took off.

CROSS-REFERENCE: See Chapter 14 for a discussion about the difference between hackers (who just like to play with computers) and crackers (who break into computer systems and cause damage).

Today, there are hundreds of software developers around the world contributing software to the Linux effort. Because the source code for the software is freely available, anyone can work on it, change it, or enhance it. Developers are encouraged to feed their fixes and improvements back into the community so that Linux can continue to grow and improve.

On top of the Linux kernel effort, the creators of Linux also drew on a great deal of system software and applications that are now bundled with Linux from the GNU software effort (GNU stands for "GNU is Not UNIX"), which is directed by the Free Software Foundation (`www.gnu.org`). There is a vast amount of software that can be used with Linux, all of which includes features that can compete with or surpass those of any other operating system in the world.

If you have heard Linux described as a free version of UNIX, there is good reason for it. Although much of the code for Linux started from scratch, the blueprint for what the code would do was created to follow POSIX standards. POSIX (Portable Operating System Interface for UNIX) is a computer industry operating system standard that every major version of UNIX complied with. In other words, if your operating system was POSIX-compliant, it was UNIX. See the next section describing Linux's roots in the UNIX operating system.

Linux's Roots in UNIX

Linux grew within a culture of free exchange of ideas and software. Like UNIX — the operating system on which Linux is based — the focus was on keeping communications open among software developers. Getting the code to work was the goal, without much concern

about who owned the code, and the Internet was the primary communications medium. What, then, were the conditions that made the world ripe for a computer system such as Linux?

What Is an Operating System?

An operating system is made up of software instructions that lie between the computer hardware (disks, memory, ports, and so on) and the application programs (word processors, Web browsers, spreadsheets, and so on). At the center is the kernel, which provides the most basic computing functions (managing system memory, sharing the processor, opening and closing devices, and so on). Besides the kernel, an operating system provides other basic services needed to operate the computer, including:

- **File systems** — The file system provides the structure in which information is stored on the computer. Information is stored in files, primarily on hard disks inside the computer. Files are organized within a hierarchy of directories. The Linux file system holds the data files that you save, the programs you run, and the configuration files that set up the system.
- **Device drivers** — These provide the interfaces to each of the hardware devices connected to your computer. A device driver enables a program to write to a device without needing to know details about how each piece of hardware is implemented. The program opens a device, sends and receives data, and closes a device.
- **User interfaces** — An operating system needs to provide a way for users to run programs and access the file system. Linux has both graphical and text-based user interfaces. GNOME and KDE provide graphical user interfaces, whereas shell command interpreters (such as `bash`) run programs by typing commands and options.
- **System services** — An operating system provides system services, many of which can be started automatically when the computer boots. In Linux, system services can include processes that mount file systems, start your network, and run scheduled tasks. In Linux, many services run continuously, enabling users to access printers, Web pages, files, databases, and other computing assets over a network.

Without an operating system, an application program would have to know the details of each piece of hardware, instead of just being able to say, “open that device and write a file there.”

In the 1980s and 1990s, while Microsoft flooded the world with personal computers running DOS and Windows operating systems, power users demanded more from an operating system. They ached for systems that could run on networks, support many users at once (multiuser), and run many programs at once (multitasking). DOS (Disk Operating System) and Windows didn’t cut it.

UNIX, on the other hand, grew out of a culture where technology was king and marketing people were, well, hard to find. Bell Laboratories in Murray Hill, New Jersey, was a think tank where ideas came first and profits were somebody else's problem. A quote from Dennis Ritchie, co-creator of UNIX and designer of the C programming language, in a 1980 lecture on the evolution of UNIX, sums up the spirit that started UNIX. He was commenting on both his hopes and those of his colleagues for the UNIX project after a similar project called Multics had just failed:

> *What we wanted to preserve was not just a good environment in which to do programming, but a system around which a fellowship could form. We knew from experience that the essence of communal computing as supplied by remote-access, time-shared machines, is not just to type programs into a terminal instead of a keypunch, but to encourage close communication.*

In that spirit, the first source code of UNIX was distributed free to universities. Like Linux, the availability of UNIX source code made it possible for a diverse population of software developers to make their own enhancements to UNIX and share them with others.

By the early 1980s, UNIX development moved from the organization in Murray Hill to a more commercially oriented development laboratory in Summit, New Jersey (a few miles down the road). During that time, UNIX began to find commercial success as the computing system of choice for applications such as AT&T's telephone switching equipment, for supercomputer applications such as modeling weather patterns, and for controlling NASA space projects.

Major computer hardware vendors licensed the UNIX source code to run on their computers. To try to create an environment of fairness and community to its OEMs (original equipment manufacturers), AT&T began standardizing what these different ports of UNIX had to be able to do to still be called UNIX. To that end, compliance with POSIX standards and the AT&T UNIX System V Interface Definition (SVID) were specifications UNIX vendors could use to create compliant UNIX systems. Those same documents also served as road maps for the creation of Linux.

Today, Linux continues to aim toward POSIX compliance, as well as compliance with standards set by the new owner of the UNIX trademark, The Open Group (`http://www.unix-systems.org/`).

Common Linux Features

No matter what version of Linux you use, the piece of code common to all is the Linux kernel. Although the kernel can be modified to include support for the features you want, every Linux kernel can offer the following features:

- **Multiuser** — Not only can you have many user accounts available on a Linux system, you can also have multiple users logged in and working on the system at the same time. Users can have their own environments arranged the way they want: their own home

directory for storing files and their own desktop interface (with icons, menus, and applications arranged to suit them). User accounts can be password-protected, so that users can control who has access to their applications and data.

- **Multitasking** — In Linux, it is possible to have many programs running at the same time, which means that not only can you have many programs going at once, but that the Linux operating system can itself have programs running in the background. Many of these system processes make it possible for Linux to work as a server, with these background processes listening to the network for requests to log in to your system, view a Web page, print a document, or copy a file. These background processes are referred to as *daemons*.
- **Graphical User Interface (X Window System)** — The powerful framework for working with graphical applications in Linux is referred to as the X Window System (or simply X). X handles the functions of opening X-based graphical user interface (GUI) applications and displaying them on an X server process (the process that manages your screen, mouse, and keyboard).

  On top of X, you use an X-based desktop environment to provide a desktop metaphor and window manager to provide the look-and-feel of your GUI (icons, window frames, menus, and colors, or a combination of those items called *themes*). There are several desktop environments and several desktop managers to choose from. (Red Hat provides a few desktop managers, but focuses on GNOME and KDE desktop environments.)
- **Hardware support** — You can configure support for almost every type of hardware that can be connected to a computer. There is support for floppy disk drives, CD-ROMs, removable disks (such as DVDs and Zip drives), sound cards, tape devices, video cards, and most anything else you can think of.

NOTE: Not every hardware manufacturer provides Linux drivers with their peripheral devices and adapter cards. Although most popular hardware will be supported eventually in Linux, it can sometimes take a while for a member of the Linux community to write a driver.

- **Networking connectivity** — To connect your Linux system to a network, Linux offers support for a variety of local area network (LAN) boards, modems, and serial devices. In addition to LAN protocols, such as Ethernet (both wired and wireless), all the most popular upper-level networking protocols can be built-in. The most popular of these protocols is TCP/IP (used to connect to the Internet). Other protocols, such as IPX (for Novell networks) and X.25 (a packet-switching network type that is popular in Europe), are also available.
- **Network servers** — Providing networking services to the client computers on the LAN or to the entire Internet is what Linux does best. A variety of software packages are available that enable you to use Linux as a print server, file server, FTP server, mail server, Web server, news server, or workgroup (DHCP or NIS) server.

- **Application support** — Because of compatibility with POSIX and several different application programming interfaces (APIs), a wide range of freeware and shareware software is available for Linux. Most GNU software from the Free Software Foundation will run in Linux (although some may take a bit of tweaking).

NOTE: Because of the popularity of the Red Hat Package Management (RPM) format for packaging software, many software packages are available on the Internet in RPM format. If the RPM version matches your processor type (most have i386 and or i686 versions available), you can install the package without building and compiling the package. See Chapters 2 and 5 for information on working with RPM packages.

Primary Advantages of Linux

When compared to different commercially available operating systems, Linux's best assets are its price and its reliability. Most people know that its initial price is free (or at least under $100 when it comes in a box or with a book). However, when people talk about Linux's affordability, they are usually thinking of its total cost, which includes the capability of using inexpensive hardware and compatible free add-on applications. Although commercial operating systems tend to encourage upgrading to later hardware, Linux doesn't (although faster hardware and larger disks are nice to have).

In terms of reliability, the general consensus is that Linux is comparable to many commercial UNIX systems but more reliable than most desktop-oriented operating systems. This is especially true if you rely on your computer system to stay up because it is a Web server or a file server. (You don't have to reboot every time you change something.)

Another advantage of using Linux is that help is always available on the Internet. There is probably someone out there in a Linux newsgroup willing to help you get around your problem. Because the source code is available, if you need something fixed you can even patch the code yourself! On the other hand, I've seen commercial operating system vendors sit on reported problems for months without fixing them. Remember that the culture of Linux is one that thrives on people helping other people.

NOTE: If you have general questions about Red Hat Linux, try the `linux.redhat.misc` newsgroup. For specific questions about networking or hardware, try the following newsgroups: `comp.os.linux.networking` and `comp.os.linux.hardware`, respectively.

What Is Red Hat Linux?

Having directories of software packages floating extraneously around the Internet was not a bad way for hackers to share software. However, for Linux to be acceptable to a less technical population of computer users, it needed to be simple to install and use. Likewise, businesses that were thinking about committing their mission-critical applications to a computer system would want to know that this system had been carefully tested.

To those ends, several companies and organizations began gathering and packaging Linux software together into usable forms called *distributions.* The main goal of a Linux distribution is to make the hundreds of unrelated software packages that make up Linux work together as a cohesive whole. The most popular distribution is Red Hat Linux.

Red Hat Linux is a commercial product produced by Red Hat, Inc. You can walk into a store and buy a boxed set of CDs and manuals. Or you can get Red Hat Linux free by downloading it over the Internet or by installing it from CDs that come with books such as this one. The boxed set provides technical support on installation and an extra CD that contains limited and demo versions of commercially available Linux application packages (such as word processors and database applications). Check the Red Hat Web site (`www.redhat.com`) for details on what is included with Red Hat products.

Why Choose Red Hat Linux?

To distinguish themselves from other versions of Linux, each distribution adds some extra features. Because many power features included in most Linux distributions come from established open source projects (such as Apache, Samba, KDE, and so on), often enhancements for a particular distribution exist to make it easier to install, configure, and use Linux. Also, because there are different software packages available to do the same jobs (such as window managers or a particular server type), a distribution can distinguish itself by which packages it chooses to include and feature.

Choosing Red Hat Linux as your distribution puts you in good company. Computer companies such as IBM and Hewlett-Packard offer Red Hat Linux on their high-end server hardware. High-profile customers such as Amazon.com rely on Red Hat Linux as the primary operating system to support their business. This is the same operating system that you and thousands of others like you can use to run a small business, a home network, or a personal Web server.

Red Hat Linux has set itself apart from other Linux distributions with these features:

- **Software packaging** — Red Hat, Inc. created the Red Hat Package Management (RPM) method of packaging Linux. RPMs allow less technically savvy users to easily install Linux software. With RPM tools, you can install from CD, hard disk, over your LAN, or over the Internet. It's easy to track which packages are installed or to look at the contents of a package. Because RPM is available to the Linux community, it has become one of the de facto standards for packaging Linux software.

CROSS-REFERENCE: Chapter 5 describes how to install RPM packages.

- **Easy installation** — The Red Hat Linux installation process provides easy steps for installing Linux. During installation, Red Hat also helps you take the first few steps toward configuring Linux. You can choose which packages to install and how to partition your hard disk. You can even get your desktop GUI ready to go by configuring your video card, user accounts, and even your network.

CROSS-REFERENCE: Chapter 2 covers Red Hat Linux installation.

- **UNIX System V–style run-level scripts** — To have your system services (daemon processes) start up and shut down in an organized way, Red Hat Linux uses the UNIX System V mechanism for starting and stopping services. Shell scripts (that are easy to read and change) are contained in subdirectories of `/etc`. When the run level changes, such as when the system boots up or you change to single-user mode, messages tell you whether each service started correctly or failed to execute properly (a very nice feature!). Chapter 12 describes how to use run-level scripts.
- **Desktop environments (GNOME and KDE)** — To make it easier to use Linux, Red Hat Linux comes packaged with GNOME and KDE desktop environments. GNOME is installed by default and offers some nice features that include drag-and-drop protocols and windows that operate like window shades. KDE is another popular desktop manager that includes a wide range of tools tailored for the KDE environment, such as the KDE Control Center for configuring the desktop.
- **Desktop look-and-feel** — With Red Hat Linux 9, whether you use KDE or GNOME as your desktop environment, you can expect to see many of the same icons and menus to help standardize how you use your Red Hat Linux system. Tools you can launch from those environments help you configure your network, set up servers, watch log files, and manage system services.
- **GUI Administration tools** — There are some helpful configuration tools for setting up some of the trickier tasks in Linux. Several different GUI tools provide a graphical, form-driven interface for configuring networking, users, file systems, and initialization services. Instead of creating obtuse command lines or having to create tricky configuration files, these graphical tools can set up those files automatically.

NOTE: There are advantages and disadvantages of using a GUI-based program to manipulate text-based configuration files. GUI-based configuration tools can lead you through a setup procedure and error-check the information you enter. However, some features can't be accessed through the GUI, and if something goes wrong, it can be trickier to debug.

- **Testing** — The exact configuration that you get on a Red Hat Linux distribution has been thoroughly tested by experts around the world. The simple fact that a software package is included in the Red Hat Linux distribution is an indication that it has achieved a certain level of quality.
- **Automatic updates** — The software packages that make up Red Hat Linux are constantly being fixed in various ways. To provide a mechanism for the automatic selection, download, and installation of updated software packages, Red Hat created the Red Hat Network. Using the Red Hat Network Web site or the `up2date` command, you can receive critical security fixes and patches very simply over the Internet.

NOTE: Red Hat now offers an economical service for getting critical updates and patches to Red Hat Linux that I strongly recommend to anyone whose system is always up on the Internet. For $60 a year, you get security e-mail alerts and the ability to do quick downloads and install patches. (See Chapter 10 for details.)

New Features in Red Hat Linux 9

With Red Hat Linux 9, Red Hat is sending clear messages about the direction it is taking its operating system. A glance at the desktop will tell you that it is undeniably a Red Hat Linux system. Instead of offering multiple, low-quality versions of every service, Red Hat is backing select services, then integrating, testing, and supporting them well. New on the inside of Red Hat Linux is the Native POSIX Threads Library (see the "What Is NPTL?" sidebar).

What Is NPTL?

Although you don't see it, the Native POSIX Thread Library is the most significant addition to Red Hat Linux 9 (and the main reason why the release is called 9 instead of 8.1). Threads are a way of allowing small pieces of code to run independently, without incurring the overhead it takes to start and stop an entire process.

As Ulrich Drepper said, the thread library is "…a very thin layer on top of the kernel. This helps to achieve a maximum of performance for a minimal price." (See `http://kerneltrap.org/node.php?id=422`) What does this mean to you? It could mean a few things:

- Applications that use NPTL could run much faster.
- Applications that use an older way of implementing threads might be broken at first.

The rule of thumb regarding when a release goes to a major number (such as Red Hat Linux 8 or 9, as opposed to 7.2 or 7.3) is that the release will break a significant number of applications. Some applications intended for Red Hat Linux 8 may require that code be rewritten or recompiled to run on Red Hat Linux 9.

While Red Hat Linux 9 does not provide many new major features, it is a great product to choose if you are going to bet your business on an operating system. Inside Red Hat Linux 9 are solid versions of components you need in a high-quality desktop or server system. Here is a list of major components in Red Hat Linux 9 (with version numbers):

- Linux kernel: version 2.4.20
- GNOME (desktop environment): version 2.2
- KDE (desktop environment): version 3.1
- GCC (GNU C language compilation system): version 3.2.2
- Apache (Web server): version 2.0.40

- Samba (Windows SMB file/printer sharing): version 2.2.7a
- CUPS (print services): version 1.1.17
- Sendmail (mail transport agent): version 8.12.8
- vsFTPd (secure FTP server): version 1.1.3
- INN (Usenet news server): version 2.3.4
- MySQL (database server): version 3.23.54a
- BIND (Domain name system server): version 9.2.1

TIP: If you want the latest features in Linux when looking at different Linux distributions, compare the version numbers shown above. Version numbers that Linux distributors such as Mandrake, SUSE, and Red Hat associate with their releases can be arbitrary. By comparing versions of the kernel, KDE and GNOME desktops, and GNU compiler they are using, you can tell which distribution actually has the latest features.

As Red Hat continues to consolidate its distribution, some popular packages have been dropped since Red Hat Linux 8, such as the following:

- **WindowMaker** — As Red Hat tightens its focus on MetaCity window manager (for GNOME) and KWin (for KDE), this window manager has been dropped..
- **WuFTPd** — This FTP server was dropped from Red Hat Linux 9. The vsFTPd package is now the recommended (and only) FTP server included with Red Hat Linux.
- **Fortune-mod** — This software for showing little fortune messages was dropped because some of its contents may have been copyrighted.
- **Wine** — This software, which allows you to run many Microsoft Windows software packages in Linux, was dropped from the distribution because of developer resource constraints.

Here are a few other packages that are noted as deprecated (slated to be dropped in the future):

- **Pine** — This popular mail package is beset by licence-related issues..
- **LPRng** — This printing service has been superceded by CUPS as Red Hat's preferred printing service.
- **LILO** — This boot loader has been replaced by GRUB by default.
- **Sndconfig** — Redhat-config-soundcard is recommended for configuring sound cards.
- **Ncpfs** and **Mars-nwe** — These packages run NetWare utilities and set up NetWare servers in Linux, respectively. They are not “part of the Red Hat Linux product profile."

See Appendix B for information on other packages no longer included in Red Hat Linux.

NOTE: Just because a package has been dropped from Red Hat Linux doesn't mean that you can't still get and use the package. In fact, I tell how to find and install packages like Wine and WuFTPd in this book.

The following paragraphs describe many of the major features in Red Hat Linux 9.

Red Hat config tools

Red Hat has added to their growing arsenal of graphical administrative tools. Since dropping the linuxconf and bypassing the Webmin graphical administrative interfaces, Red Hat has been steadily developing and adding its own administrative tools to its distribution. As a result, a systems administration can often skip running shell commands and editing plain-text configuration files to set up servers, manage system resources, or add users.

The following is a list of Red Hat GUI packages and what each is used to configure:

- **redhat-config-bind:** Domain Name System server.
- **redhat-config-date:** System time and date.
- **redhat-config-httpd:** Apache Web server.
- **redhat-config-language:** Languages for Red Hat Linux.
- **redhat-config-keyboard:** Keyboard selection.
- **redhat-config-kickstart:** Kickstart files for unattended Red Hat Linux installations.
- **redhat-config-mouse:** A mouse.
- **redhat-config-network:** Network interfaces.
- **redhat-config-nfs:** Network File System shared directories.
- **redhat-config-packages:** Red Hat Linux software.
- **redhat-config-printer:** Printers.
- **redhat-config-printer-gui:** Printers (GUI).
- **redhat-config-printer-tui:** Printers (text-based).
- **redhat-config-proc:** Kernel tunable parameters.
- **redhat-config-rootpassword:** Change your root password.
- **redhat-config-samba:** Samba Windows file/printer sharing (new in Red Hat Linux 9).
- **redhat-config-securitylevel:** Iptables firewalls.
- **redhat-config-services:** System services.
- **redhat-config-soundcard:** Sound card.
- **redhat-config-time:** Set time and date.
- **redhat-config-users:** User accounts.
- **redhat-config-xfree86:** X display and monitor.
- **redhat-logviewer:** System log file viewer.

You can launch the tools associated with the previous packages either from the main Red Hat menu or from a Terminal window. In most cases, the name of the command you run to launch the window is the same name as the package it comes in.

Red Hat desktop interfaces

KDE and GNOME are desktop environments that provide a framework for running and developing graphical applications and offer a full range of preferences to allow users to tailor the exact desktop look-and-feel. There was some hubbub surrounding the new "Red Hat" look-and-feel implemented in Red Hat Linux 8, which gave both GNOME and KDE similar menus, icons, and colors. Die-hard GNOME and KDE users, however, are free to change their desktops however they like.

Unlike previous releases of Red Hat Linux, you have to work a bit to get the KDE desktop. If you choose to install Red Hat Linux as a Personal Desktop or Workstation system, you get the GNOME desktop by default. You must specifically ask to install additional packages to get KDE. By default, it is only included in an Everything install.

Additional software packages

By far, most of the enhancements to Red Hat Linux in version 9 have come in existing packages. Some new packages have been added, however. Along with those mentioned in previous sections, the following list gives you an idea of some of the new software packages added to Red Hat Linux 9:

- **bluez-utils** — Utilities for configuring Bluetooth wireless networking devices.
- **ckermit** — Replaces the gkermit package for dial-up networking.
- **ddd** — Contains the Data Display Debugger, a GUI for command-line debuggers.
- **desktop-printing** — Contains support for drag-and-drop printing to CUPS printers.
- **expectk** — Contains the expectk application for automating interactive applications.
- **fontilus** — An extension to Nautilus file manager for managing fonts.
- **gnome-themes** — Contains themes to replace the default GNOME Blue Curve theme.
- **gstreamer** — Contains the GStreamer framework for streaming media.
- **gthumb** — Contains the gthumb utility for managing image collections.
- **kde*** — The entire packaging of KDE utilities was reorganized for KDE 3.1.
- **nautilus-cd-burner** — A CD burning utility that is integrated into Nautilus.
- **nautilus-media** — Contains GStreamer audio support in Nautilus.
- **printman** — Contains the GNOME print manager for monitoring printing.
- **redhat-config-samba** — Contains a graphical tool for configuring Samba file sharing.
- **vconfig** — Contains the vconfig utility for configuring VLAN parameters.

There are other new packages in Red Hat Linux 9 as well. For a complete list of all packages in Red Hat Linux 9 (all of which are on the CDs that come with this book), see Appendix B.

The Culture of Free Software

I would be remiss to not say something about the culture of free software development from which Linux has thrived and will continue to thrive. The copyright for Red Hat Linux is covered under the GNU public license. That license, which most free software falls under, provides the following:

- **Author rights** — The original author retains the rights to his or her software.
- **Free distribution** — People can use the GNU software in their own software, changing and redistributing it as they please. They do, however, have to include the source code with their distribution (or make it easily available).
- **Copyright maintained** — Even if you were to repackage and resell the software, the original GNU agreement must be maintained with the software. This means that all future recipients of the software must have the opportunity to change the source code, just as you did.

It is important to remember that there is no warranty on GNU software. If something goes wrong, the original developer of the software has no obligation to fix the problem. However, the Linux culture has provided resources for that event. Experts on the Internet can help you iron out your problems, or you can access one of the many Linux newsgroups to read how others have dealt with their problems and to post your own questions about how to fix yours. Chances are that someone will know what to do — maybe even going so far as to provide the software or configuration file you need.

NOTE: The GNU project uses the term *free software* to describe the software that is covered by the GNU license. On occasion, you may see the term *open-source software* being used to describe software. Though source code availability is part of the GNU license, the GNU project claims that software defined as open source is not the same as free software because it can encompass semi-free programs and even some proprietary programs. See `www.opensource.org` for a description of open-source software.

Summary

Linux is a free computer operating system that was created by Linus Torvalds in 1991 and has grown from contributions from software developers all over the world. Red Hat Linux is a distribution of Linux that packages together the software needed to run Linux and makes it easier to install and run.

Features in Red Hat Linux include a simplified installation procedure, Red Hat Package Management (RPM) tools for managing the software, and easy-to-use GNOME and KDE desktop environments. You can get Red Hat Linux from the Internet, from distributions that

come with books such as this one, or from a commercially available boxed set of Red Hat Linux software.

Linux is based on a culture of free exchange of software. Linux's roots are based in the UNIX operating system. UNIX provided most of the framework that was used to create Linux. That framework came in the form of the POSIX standard, which defined the interfaces a UNIX system needs to support in order to be a UNIX system.